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(54) Papermachine clothing

(57) Papermachine clothing is made from a sheet of partially fused polymeric or other particles and may include a reinforcing structure embedded wholly within the sheet. Suitable polymers are polyethylene, polypropylene and polyurethane. Instead of a polymer, metal particles may be used. The reinforcement may be a woven or non-woven fabric, a mesh or chopped fibres and may comprise bonding or bicomponent fibres. A coating of fluoropolymer or of organically modified ceramic may be applied. The fused particles may be combined with a needled felt.

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PAPERMACHINE CLOTHING

The present invention relates to papermachine clothing comprising partially fused particles.

A suitable particulate material can be partially fused by means of a high energy input to give a structure containing a multitude of interstices. When heated above their crystalline melting point, the particles do not fluidise, but adopt a viscoelastic form. The external shape of the individual particles is substantially retained so as to provide an array of contiguously dispersed neighbouring particles. Usually for the successful partial fusion of polymers ultra high molecular weight materials (UHMW) must be used, a typical molecular weight being 3 to 9 x 10^6 g/mol. However, some materials such as polyurethane and thermoplastic polyurethane do not need to possess an ultra high molecular weight for successful partial fusion.

EP 0187967 describes papermachine clothing comprising a base cloth having a coating of a sintered product on one side thereof. The sintered product does not cover both sides of the base fabric. The base fabric is thus finely engineered so as to avoid marking of the paper. Such fabrics are made using long and arduous preparation techniques.

According to the present invention there is provided papermachine clothing made from partially fused particles, but optionally comprising a reinforcing structure embedded wholly within the papermachine clothing.

The fabrics of the invention can be made much more quickly than those made by the method of EP 0187967 and are

thus relatively cheap to manufacture.

The particles are preferably polymeric, although other materials such as metals may be used.

This partially fused material exhibits greatly enhanced abrasion resistance. The machine side of the material may be grooved to increase the hydraulic differential between the paper face of the fabric and the press roll and to aid instalment of the fabric on the machine where the papermachine suction box surfaces are grooved.

Preferred polymers for partial particle fusion include polyalkenes such as polyethylene and polypropylene, polyurethane, thermoplastic polyurethane or EPDM (ethylene propylene diene monomer). One example polymer is the Hostalon GUR (trade mark of Hoechst AG) range of HUMW polyethylene having a molecular weight of 3.2 to 8 x 10^6 g/mol. Another example is the Goodrich product 58810 (TM) which has a shore hardness of 90.

A sheet of partially fused polymer may be prepared by evenly spreading the polymer powder into a layer of uniform thickness of typically 3 to 4 mm and then heating the polymer. The uniform polymer layer may be obtained by using a roller or blade. Alternatively the polymer powder may be moulded to the desired thickness. The layer of polymer is heated to say 230°C to 240°C for a time period in the order of 1.9 mins per mm of sheet thickness, allowing for shrinkage due to partial fusion forces. Continuous sheet production may involve distributing the powdered polymer onto a tensioned metal belt which passes through an oven where the belt is heated from

above and underneath by IR heaters to facilitate partial fusion. The finished product may be mechanically treated, e.g. by grinding to give a smooth finish.

Some materials such as thermoplastic polyurethanes on being subjected to a high energy input partially fluidise and partially adopt a viscoelastic form as previously described so as to provide a partially fused product having superior toughness.

Other materials do not fluidise to a significant extent. Such sheets of solely partially fused polymeric particles will have only one drawback in that each polymer particle is only bonded at its tangent. The force required to break these bonds will not be particularly great and therefore a partially fused sheet will readily shed polymeric particles when subjected to frictional or impact forces. A reinforcement structure may be embedded wholly within such materials. This may comprise fibres extending through the partially fused product. Alternatively the reinforcement may comprise a fabric such as a nonwoven fabric, a mesh fabric, a plain weave fabric or a random dispersion of chopped fibres.

Bonding or bicomponent fibres are preferred, the melting or softening point of which is greater than that of the polymeric particles. On a macro scale the fibres may be formed into yarns. The yarns may form a woven or nonwoven matrix.

An example bicomponent fibre is Danaklon ES-C (trade mark) which comprises a polyethylene core and a polypropylene sheath. The fibre has a high adhesion strength and a low

bonding temperature of 135 to 145°C. An example bonding fibre is Dacron 134 (trade mark of DuPont) which is a polyethylene terephthalate fibre with a melting/softening point of 205°C. One particularly suitable fibre is polyamide 6, having a melting point of 235°C. A sheath core bicomponent fibre with a polyamide 6 sheath and polyamide 6:6 core may also be appropriate.

The permeability of the partially fused product may be improved by incorporating a blowing agent into the product during partial particle fusion or using a porous support medium (e.g. partially fused metal) to enable the partially fusible powder to be fluidised immediately prior to melt bonding.

The particles may be layered in different size fractions to produce a pyramidal porosity profile and, therefore, a permeability gradient. The partially fused sheet may be coated with fluoropolymers to give an improved wipe-clean, hydrophobic surface particularly advantageous for preventing re-wet of papermachine clothing and reducing fabric contamination. An ormocer (organically modified ceramic) coating would confer significant abrasion resistance, with back-flushing of air being employed at the point of lick-up during coating application to ensure the permeability of the structure is maintained.

A hybrid needled felt/partially fused particle surface may be formed by partially embedding polymer particles in the fibrous surface to act as a foundation for the final partially fused layer.

A further advantage of this method is the ease of addition of pigments, for example, a marking such as a bar may be incorporated to aid alignment of fabrics on machines and a logo can easily be incorporated.

CLAIMS

1. Papermachine clothing made from partially fused particles, but optionally comprising a reinforcing structure embedded wholly within the papermachine clothing.

2. Papermachine clothing as claimed in claim 1, wherein the said particles are polymeric.

3. Papermachine clothing as claimed in claim 1 or claim 2, wherein the particles comprise a polyalkene, polyurethane or EPDM.

4. Papermachine clothing as claimed in claim 1, wherein the said particles comprise a metal.

5. Papermachine clothing as claimed in any preceding claim, wherein the side of the clothing operative to be located on the papermachine comprises grooves.

6. Papermachine clothing comprising the said reinforcing structure as claimed in any preceding claim, wherein the reinforcing structure comprises fibres extending through the mass of partially fused particles.

7. Papermachine clothing comprising the said reinforcing structure as claimed in any of claims 1 to 5, wherein the reinforcing structure comprises a fabric.

8. Papermachine clothing comprising the said reinforcing structure, as claimed in any of claims 1 to 5, wherein the reinforcing structure comprises a random dispersion of chopped fibres.

9. Papermachine clothing comprising the reinforcing structure as claimed in any preceding claim, wherein the reinforcing structure comprises fibres having a melting or

softening point which is greater than that of said partially fused particles.

10. Papermachine clothing comprising the reinforcing structure as claimed in any preceding claim, wherein the reinforcing structure comprises bonding or bicomponent fibres.

11. Papermachine clothing as claimed in any preceding claim, wherein the partially fused particles are layered in different size fractions.

12. Papermachine clothing as claimed in any preceding claim, having a fluoropolymer coating thereon.

13. Papermachine clothing as claimed in any preceding claim, having an ormocer coating thereon.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	Application number GB 9420963.2
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Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASES: WPI	Documents considered relevant following a search in respect of Claims :- 1 TO 13

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 1090877	(LITTLE) see eg. page 3 lines 33 to 60	1, 2
X	GB 0883905	(PORTALS) see eg. page 2 lines 7 to 15	1, 4
X	EP 0342171 A2	(ALBANY) see whole document, eg. column 3 line 47 to column 4 line 17	1, 2, 3, 7
X	EP 0187967 A2	(ALBANY) see whole document, eg. pages 7 and 8	1, 2, 3, 7

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